TMF

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THE MAC FLYER-For Greater Safety in MAC Air Operations

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Mrs. Frances A. Caldwell — Writer/Editor
Mr. Tommy F. O'Laughlin — Art Director

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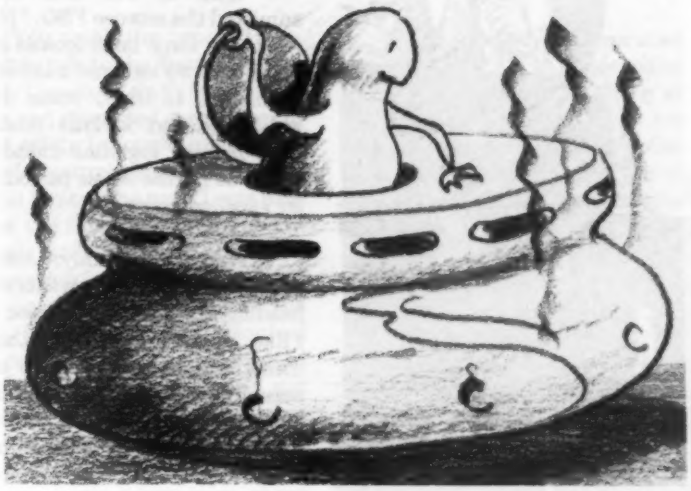
Moon Rocks

Use logic to understand and manage human factors.



By Maj. Robert A. Stettler, USAF
1550 TTS, Kirtland AFB, New Mexico

W.G. "Bill" Fizzo had a real problem. Three A.M. and his eyes were still as wide open as C-5 clamshell doors gulping a Titan 4 rocket casing. After two years in the safety business and 40 gigabits of good information passed on to flight crews, the downward trend in mishap rates had become as stubbornly flat as his IRA investment returns. Puzzling indeed! It seemed even the greenest arrivals from the schoolhouse really knew aircraft systems, local instrument procedures and, in general, everything that makes flying safe. So why were there still those two or three mishaps per hundred thousand hours? More to the point, what could be done about them?

Turning over for the hundredth time in search of a less uncomfortable position, the flight safety officer (FSO) finally crashed into a REM sleep mode. His frontal lobes were still in overdrive, working the puzzle to prevention of those last few mishaps. Wasn't there ANYONE who could help. . . .?

"Yo Earthling! Thanks for the crash cart response, great TA support, and where's the bar? This Cowboy is thirsty."

Not exactly what W.G. Fizzo expected to hear as he wheeled up to the odd craft settled on the little-used runway. Having picked up a crash net report of a distressed craft, Bill had hustled out, only to find the darnedest contraption with a strange occupant.

Instinctively following his time-proven, penetrating investigative techniques, Bill came right to the point. "Are you okay? What happened?"

"Well," came the cheerful

Second Place 1988 MAC Flight Safety Writing Contest

reply, "Let's discuss this on the way to the club. It's been an exciting day. Besides, tox tests don't work on me—my normal circulatory content resembles a brew and green road tar mixture that makes your machines go whacko."

That made sense to Bill and during the truck ride, Cowboy continued. "Things were pretty slow until about a gigaflop past Alpha Centurion. Then I got a flux in my midlife crisis pressure and my omni-presence nav system locked onto your NAVSTAR-CNN dish interlink instead of the galactic mag inverted gyro beacon. By the time I got that mess figured out, the auto computer had me on short final for your drome and I just didn't get to the Gear Down Checklist. Sure hope you don't mind all the runway skid marks."

"Don't worry about it," replied Bill. "I just hope fab shop can fix your galactic go-cart. While we're waiting in comfort at the club you can clue me in on how you folks generally keep out of trouble at warp five. Apparently your designers haven't gotten all the systems to where nothing can possibly go wrong."

"That's for sure. We're way ahead of everything else on the preowned spacecraft market, but there can still be a molecular mismatch somewhere along the line. Never had so many systems lunching simultaneously like this time, though.

"Say, Bill, you mentioned you wanted some advice on mishap prevention. What's the problem? Poor equipment? Lousy parts support? Betcha it's bad maintenance, right?"

"Wish it was that easy," admitted the morose FSO. "Nope. All those have been looked at in detail and we've fixed a lot of the problems. In fact, since 1981, we've reduced serious mishaps with mostly logistics causes to below 30 for the whole period. It's an excellent record."

"Whoa, good buddy," said the visitor. "This conversation is heading in a direction I'm not sure I like. You're trying to say there's something wrong with the stick actuators and the rest of the crewmembers? Just forward the bill. I think it's time for you to ship my check and me to check my ship."

"Hold on, guy. I'm most definitely *not* saying there's something wrong with us. I'm saying that with MAC safety investigators finding about 80 percent HF involvement in major mishaps, we've got to look at eliminating causes, not just counting beans. We can't afford to ignore the HF."

"Mebbe so," admitted Cowboy, ordering another round for himself and a sarsaparilla for the earthling, "but if the radios you're using are causing all those crashes, why don't you just replace them?"

"No, no. Not radios," Bill said quickly. "*Human Factors. Human Factors*. There, you made me say it. Are you happy now?"

"Wow! You're touchy about

"Paternity, position, payola, and poolhalls make good flyers?"

those human things," Cowboy commented.

"You think I'm touchy? You ought to talk to the fliers. Over the years, I've stood up in front of my peers and discussed every facet of flight safety I thought existed. We talked about physical and physiological limitations until I was blue under the fingernails and nobody complained. It was all good information and everybody agreed that good, straight info was the best idea. Even toxicological testing was grudgingly accepted after people figured out it's not smart to self-medicate, and it's not fun to fly with those who do.

"Then along comes human factors—basic information about how our grey matter affects what we do—and WHAM! parentage is suddenly questioned. You'd think nobody used their brain to fly."

"Don't believe I'll follow up on that opening," allowed Cowboy, "but tell me a little more about these humanoidisms. Don't you safety folks have some medics to help out? I thought I saw a big building as I turned base over Texas. Think it was in San Antonio and it said USAFSAM. Maybe it's some kind of anti-bureaucratic device?"

"Uh, that's School of Aerospace Medicine, and yes, they've been a big help. We've been working down their 'Four P' list for years."

"Let me guess. Paternity, Position, Payola, and Poolhalls make good fliers?"

"Close. Actually," explained the FSO, "USAFSAM identified four limitation areas affecting all aircrew members. These are physical, physiological, psychological, and psychosocial. We all understand the first two because we've discussed them for years and they're pretty logical.

"Physical refers to age, strength, and coordination. The second refers to nutrition, hypoxia, hyperventilation, lack of sleep, and hangovers. We've covered these factors extensively and we've gotten quite a bit of control over them. Crewmembers know a lot about how to manage or eliminate their effects on flying."

"Pretty clear so far," nodded Cowboy, "and my Squingnaf Commander addresses the same factors in my neck of the cosmos. Our mandatory 65 megageoburns retirement age is pretty liberal, but some guys still squawk. Personally, I think they just miss the decompression chamber. That nitrous oxide we use for rapid pressurization leaves 'em all smiling."

"Ahem, yes. Anyway, as I was saying," Bill continued, "we've institutionalized several of the first two factors. Crew rest is in the regs, experience is prized and recognized, and people just don't drink and fly anymore."

"So you're taking the heat on the last two," observed Cowboy. "Obviously your Uncle Sam must be using weird words and odd, or socially taboo, phrases. These must sound like another langague with unusual characteristics that nobody can understand or relate to. Crewmembers are sharp people. They can understand plain language. What's actually in those last two psycho things that everybody is afraid of?"

"Would you believe channelized attention, apprehension, and over/under confidence for psychological factors. Peer pressure, supervisory pressure, and ego, for psychosocial factor?"

"Sure fella, and you can stop wasting my time," scoffed Cowboy. "C'mon, what's the real description? It's fascination with UFOs, irresistible urge to strangle the FSO, and fondness for old John Wayne movies, right? Maybe an inclination to favor imported cars or real furs? Bet your shrinks would really like to find out that under my sleep capsule at home I've got a copy of *The Sex Life of Moon Rocks.* They'd have a ball with that. No wonder everybody's so defensive."

"Hey, cool your jets! That's just the problem I've been talking about," explained the frustrated FSO. "Nobody believes the elements of psychological and psychosocial factors, *as applied to our daily flying,* are just as clear and useful to study as the first two that we've handled all along.

"What's more, the terms are understood and used by all of us. What's so strange about channelized attention? We show it in the simulator all the time simply to demonstrate the point and help crewmembers avoid the hazard. Anyone here have a problem recognizing or describing fatigue

or overconfidence?"

"Okay. So far you've convinced me that first, there's a real human factor problem causing your mishaps, those caused by people failure, not machine failure; and second, there shouldn't be antagonism toward folks studying those human factors.

"Guess that means you expect to analyze people and predict which are going to have mishaps?" said Cowboy. "You know. If you're a Pisces from the southwest and flunked geometry, you can't fly tomorrow because you're 2.37 times more likely than your buddy to trip over the wheel chocks."

"No such thing in sight," Bill countered. "Been investigated as recently as 1984 by Dr. Eric Farmer. He tried to identify a 'mishap personality' but had little success. His best find was that pilots who took more risks might have more accidents. Big stuff."

"Look Bill," said Cowboy, "we've gone through six beers and five sarsaparillas in four hours, so it's time for the standard third point. Besides, I need to get to the nearest Texalax service station before it closes. Just what is it your Air Force wants to do?"

"Instigate HOMR," said Bill proudly.

"See! There's one of those socially unacceptable phrases I was talking about. Don't you ever learn?"

"No, wait. That's the Human Oriented Mishap Reduction System," explained Bill hastily. "Basically, it's run by AFISC and . . . ."

"Whoa. A FIST sounds like something coming real fast toward my face after a minor misunderstanding at the Plutoburger Palace. Those starcycle guys are not to be trifled with. Besides, you guys sure have a lot of cronyisms in your outfit."

". . . it's not fun to self-medicate and it's not fun to fly with those who do!"

"Uh, I think that's acronyms," corrected Bill, "and it's Air Force Inspection and Safety Center. Their computer has a HOMR program, deployed in December 87, that will attempt to digest some 844 human factor variables and finally provide a database for further study. I say *finally* because the concept has been around for ten years.

"All I really want to get across to crewmembers is that human factors are a reality and always were. Not only that, but we use logic and everyday terms to understand and manage human factors, all human factors, every time we fly. The trick is to keep getting better understanding and management. Now, how do I get the word out without having to dodge thrown kneeboards, survival radios, and heavy innuendos whenever I brief the subject?"

"That's a tough one all right. Look, I gotta find my ship. Double or nothing on the bar tab? Just to keep it fair, you take heads and tails, I'll take the edge, okay?"

"Sounds reasonable. Go."

A few minutes later, having lost to the official intergalactic hexathermal coin (would I lie to you?) of a cheerful Cowboy, and pondering the upper credit limits of a club card, Bill rolled up to the craft with his passenger. The dents were gone and chromed hubcaps gleamed.

"Not bad for earthlings," beamed Cowboy, shaking hands all around and heading for the ramp. "Thanks for everything and, by the way Bill, your approach to human factors seems reasonable to me, especially since I think some of that channelized attention is probably what caused my rotating spacers to stay in the well during my last landing. Have you ever considered writing an article explaining your points?"

Heading back to the office, Bill mused. Article? Nah, nobody ever reads those things.

Next day, asked where he got the idea for his latest *MAC Flyer* effort, the redeyed W.G. Fizzo modestly replied, "Let's just say imagination and outer space have the same limits." ✈

Major Stettler earned his BSME at the University of Wisconsin, and joined the Air Force in 1968. After UPT, he flew the O-2A in Vietnam, and then the T-38 in ATC. He separated from the Air Force in 1972 and, after completing law school, was admitted to the Texas Bar. He re-entered the Air Force in 1980 and has flown H-53 s since then. He currently instructs in the H-53 s at Kirtland AFB, New Mexico.

C-130 Engine-Out Landings

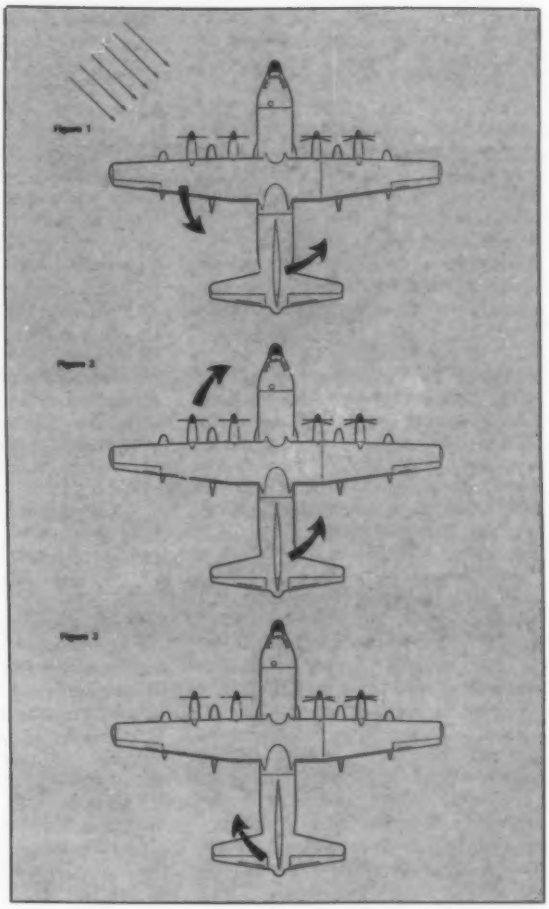
Think about it *BEFORE* it happens.

Anyone who believes a three-engine landing in the Herc is a routine affair, start questioning your perception! Engine-out landings *are* emergency procedures; we practice them that way; they're in the emergency procedures chapter; and worst of all, crews have crashed airplanes doing them!!

The most serious scenario is two engines out on the left side, outboard windmilling on NTS, landing on a short runway, at night, in weather at minimums. From this nightmare the situation can improve to a much less homicidal situation of a single inboard feathered, landing to a 12,000 ft-plus runway on a cool, sunny day. *Worse* only gets better, but never becomes *good*.

Naturally, the goal is to stop the airplane safely on the runway CENTERLINE. Getting close to this goal equates to survival. Several aerodynamic and environmental factors affect aircraft control; in some cases, full use of all flight controls is required to maintain runway centerline during rollout and stopping. We'll examine each of the flight controls and review how to use them to maintain runway centerline and minimize landing ground roll.

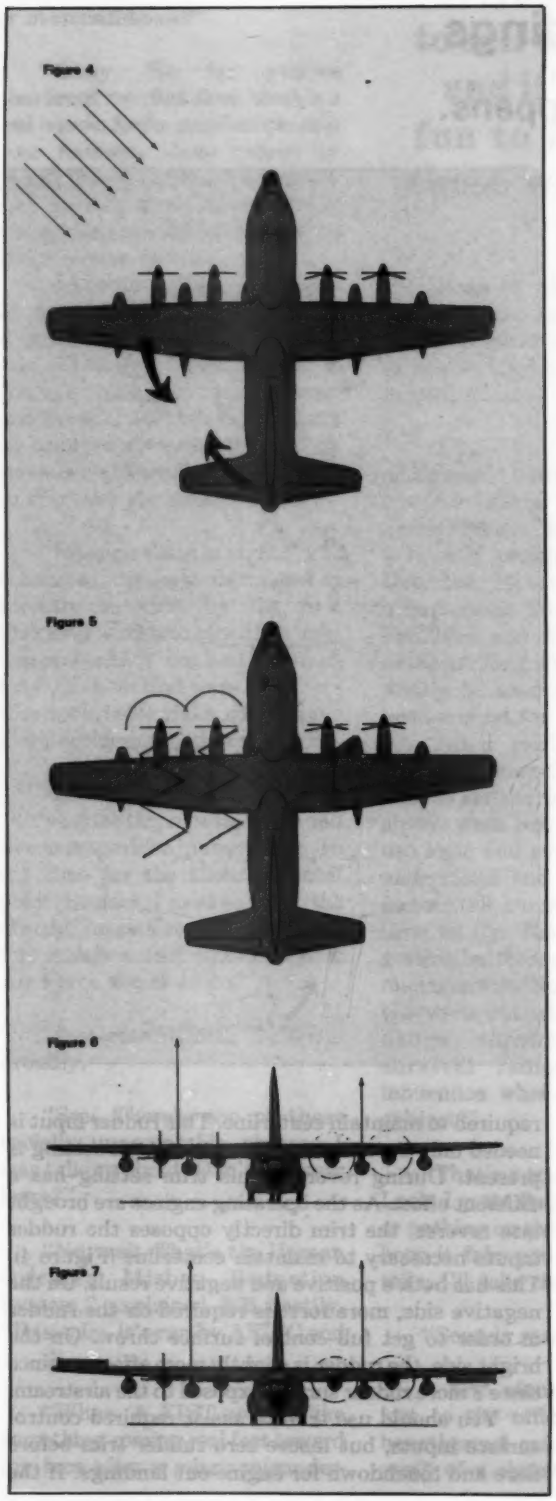
In considering each control surface, we'll assume a no-wind or runway-aligned wind condition. Crosswinds change the optimum control inputs in an amount totally dependent upon angle and velocity. *Remember this*—the airplane will tend to weather-vane into the crosswind because of the wind's affect on the vertical stabilizer (Figure 1). This tendency, coupled with asymmetric reverse, can create a severe swerve. Be prepared, and if possible, choose a runway where crosswind can be used to counter this tendency.



Use *rudders* as necessary to maintain centerline throughout the landing. ***Rudder trim, on the other hand, poses a unique problem.*** During cruise and approach, it's very likely you'll use a large amount of trim to assist in maintaining balanced flight due to high power settings. Two engines out on the same side may require full trim (Figure 2). This trim setting, sustained and present during flare and touchdown, will eventually become adverse trim. When operating engines are at zero or near-zero thrust, trim is no longer necessary since there is now an essentially symmetric power relationship among all engines.

Any trim setting will produce a yawing moment (Figure 3). A rudder input from the pilot will be required to maintain centerline. This rudder input is needed only because an unnecessary trim setting is present. During reversal, this trim setting has a different effect. As the operating engines are brought into reverse, the trim directly opposes the rudder inputs necessary to maintain centerline (Figure 4). This has both a positive and negative result. On the negative side, more force is required on the rudder in order to get full control surface throw. On the bright side, the rudder is slightly more effective since there's more rudder surface exposed to the airstream.

You should use trim to assist required control surface inputs, but insure zero rudder trim before flare and touchdown for engine-out landings. If the



pilot at the controls has been trimming throughout the approach, while gradually reducing power, trim will already be near zero. *Pilots at the controls should verify rudder trim zero prior to crossing the threshold and commencing a flare in order to use rudder and trim to best advantage.*

Ailerons should be used during engine-out landings to equalize lift on the wings in the landing rollout engine reversal. Assuming a no-wind or aligned headwind condition, an asymmetric lift condition will be present if the ailerons are left neutral when bringing engines into reverse.

In a C-130, 60% of the wing's lift is provided by propeller thrust at maximum power; therefore, reversing thrust will *spoil* a significant amount of the wings' lift. Airflow across the left wing during landing rollout engine reversal is disturbed by reverse thrust on engines 1 and 2 (Figure 5). No reverse thrust is present on 3 and 4, and the airflow is cleaner, causing the right wing to produce a lift vector of greater magnitude (Figure 6).

Think of your airplane as a tripod on wheels. If this tripod is rolling straight and you lift one of the rear wheels, the tripod will swerve. With 3 and 4 feathered, the airplane will try to swerve left due to asymmetric lift vectors. Ailerons can be used to reduce these lift vectors and reduce the tendency to swerve. As engines are reversed, full aileron toward the feathered engines will increase the lift on the left wing (down aileron) and decrease lift on right wing (up aileron) as shown in Figure 7. A near-equal lift condition now exists, reducing swerve tendency. The need for this aileron correction will decrease as airspeed is reduced and control surface effectiveness diminishes.

Elevators can be used to assist your rudders. Again, imagine the tripod on wheels. If the tripod is rolling with pressure on the nosewheel, steering inputs will be more effective. If there's no pressure forward, or if there's an uplifting force on the nosewheel, a tendency for nosewheel skid exists. As engines are reversed, forward yoke pressure will cause rudder inputs to be more effective. As the throttles are brought into reverse, a degree of forward yoke pressure will assist any rudder input. As airspeed is reduced, more elevator can be added, to full throw, as the airplane slows to taxi speed.

Feel more comfortable? Let's not be too hasty! Your preparation shouldn't end here or with the Dash One. Talk to other pilots. Correct control surfaces application is critical, but even more critical is the human moving them—you. *Don't wait until things are quiet on final before you decide to improve your knowledge of this subject!*

Adapted From: *Approach*

Techniques to Consider

There are many procedures to follow after an in-flight engine shutdown. They're all listed in several different places ranging under four or five different headings in Chapters 2, 3, 5, and 9 in the Dash One; Chapters 2, 3, 5, and others in the 55 series MAC regs; and other places. But us is the curse of our profession, sometimes we, too easily, tend to compartmentalize everything we need to do in checklist format and omit philosophical thought or understanding of what it is we're really trying to do. Such is the case in engine-out operation. We've pooled some thoughts on this subject, and the following, by no means complete, list of "other" considerations is the result:

• **Fuel Management.** A step in the engineer's Cleanup Checklist requires isolating the main tank feeding the failed engine. Give it some thought and you'll agree; however, once things settle down, you'd better get that fuel back into the management system to prevent an atrocious imbalance. We all know we never take off with a main boost pump inoperative, but we also know we've had them fail in flight. What if the failed boost pump resides over the failed engine? Gravity feed is no longer a player, fuel imbalance is. Other wrenches in this system are myriad combinations of failed quantity gauges. Caging the prop has to key your thinking along these lines.

• **Range.** In conjunction with the above, after the engine's gone, better get the One Dash One out. There are a couple figures we need to know.

•• Will you have enough fuel to make it to destination?

•• What is two-engine driftdown speed and ceiling? Remember, you had it for three-engine operation when you were a four-engine airplane, now you *are* a "three-engine" airplane. The next contingency has to shift to two-engine operations.

•• Chances are good your Equal Time Point has changed. Again, recompute.

• **What systems have you lost?** In the case of one engine out, you've lost, at a minimum, a generator and hydraulic pump. If it's number 1 or 2, configuring will take longer. Is electrical draw reduction a player?

• **Landing.** Eventually, you'll want to give this hunk of metal back to the maintainers. In fact, your plan probably includes both your crew and craft being in one piece. Now's the time to consider this factor. In selecting a landing site, the destination may not always be the best choice. We've already discussed fuel considerations; here we'll address crosswinds, fuel dumping, configuration, reversing technique, and instrument conditions.

•• **Crosswinds.** The feature article explains this consideration in detail. However, it's important to mention it again as it will be a major factor in runway selection. Granted, in some circumstances, you may not have this luxury. Remember, the pitot tube will face the crosswind.

•• **Fuel Dumping.** Don't be spring loaded to the dump position. Sometimes, the time involved may not be worth the effort when it precludes a safe, expeditious return landing. On the other hand, be prepared to dump some in a hurry if the need arises.

•• **Configuration.** You're probably most familiar with the picture of a 100% flap landing. If possible, never compound emergencies by doing things differently when you *don't* have to. Contemplate and conclude your own definition of "landing is assured." You've all practiced two-engine, no-flaps, and have seen the runway markers whizzing by in excess of 100 knots. Remember that picture when you choose configuration.

•• **Reversing technique.** On rare occasions you'll need all three engines reversed, normally you won't. Read carefully the section on this subject in the feature article. Plan this act! It'll make the difference between stopping on the runway or sinking in the mud.

•• **Instrument conditions.** We all know the Herc will fly three-engine instruments as well as it flies visual. But why execute an approach to minimums and risk an instrument missed approach/three-engine go-around. If you have to divert a great distance in the other direction to find VMC, it may well be worth it.

• **What else has failed?** Hardly a mission goes by where you haven't earned your aircraft commander's pay by deciding to fly without something. Most of the time, you do just fine. However, after the excitement of caging an engine, your thought direction, and rightfully so, goes into this pressing problem. Whatever you do, maintain total situational awareness. What problem did you take off with or what are you now flying without? Is number 3 in mechanical due to a prop flux that's getting worse? Have we all been watching number 2 because it's losing oil? What did you shut down for? Can you feasibly restart that engine and literally *live* with it until rollout? Don't omit this lifesaving option.

In summary, and that's all we can do because this list is far too involved to ever list all considerations, there's a lot to think about and plan for whenever the mighty Hercules becomes crippled.

This humble attempt at thought provocation wasn't assembled to incite argumentative response. Instead, we sincerely hope you'll use it to develop your own thought patterns. One final word, read the entire Emergency Engine Shutdown procedure, you'll find that if you experienced the most extreme catastrophic emergency during any stage of flight, this checklist, by itself, is enough to configure the airplane for a SAFE landing, without the use of either the Descent or Before Landing checklists. One more good reason for a solid backup plan and thorough crew briefing.

It Really Happened

Why do we do it?

By Major Robert M. Silver
Chief, Flight Safety
89 MAW, Andrews AFB, MD.

Sometimes you see people do something so incredibly risky that, for weeks after, you sit and puzzle over why they might have done it. It's Monday night now, and I'm still wondering about something I saw last Friday night.

I watched two *supposedly* professional aircrews take off into some of the most violent weather I've seen during 19 years of flying. One crew was flying a civilian contract carrier and the other a MAC airlifter. I don't know if the civilian crew will ever read this, but I hope the MAC crew does. I hope they recognize themselves, and think about what they did and how lucky they are to be alive and reading about what was happening in their six o'clock.

We were on the last day of an overseas Special Air Mission. We'd been out for a week and were looking forward to being home for the weekend. This final day had us flying from Mildenhall to MacDill to drop our DV; then a quick depositioning leg back home to Andrews.

We had good weather throughout Europe, but our weather luck didn't follow us across the Atlantic. The crossing was smooth, but coming down the east coast we hit moderate turbulence from the low twenties to the high thirties. The 150-knot headwind we were bucking probably had something to do with it. To cap it off, there were thunderstorms west of MacDill moving east. Our nav kept his eyes glued to the scope, making sure we had plenty of clearance. After a few weather avoidance turns, we found ourselves on an 8-mile final for Runway 04. Did I say the fun was over? Not yet. Approach control gave us surface winds that worked out to a 6-knot tailwind component. But our -135 was light and we had that long, ex-SAC runway in front of us, so, no sweat.

Well, no sweat until we checked INS groundspeed. Our IAS was 170 knots, but our speed over the earth was 230! We should've had a reference groundspeed of 176 knots. At some point between 2,000 ft MSL and the runway we were going to have a challenge. We finished configuring at glideslope intercept and started down. We had a very impressive rate of descent to stay on glideslope and it wasn't taking much power.

At 800 ft AGL, we dropped out of the shear. Our IAS shot up and we ballooned high on glideslope just as the book said we would. We let the speed bleed off, got the power back in, and put it on the ground. Until the shear, we were more prepared to take it someplace else instead of landing, but this time it worked.

During taxi, we passed the info about the shear to ATC and metro and suggested a runway change may be in order. They said they planned to do it as soon as they got the last plane in behind us.

Transient alert parked us by the fuel pits and we got a permit to proceed from customs for the crew and Space-A pax. Right about the time our DV deplaned, the rains came with much thunder, lightning, and gusting wind. We waited a few minutes for a ride into the passenger terminal to drop manifests and release seats to D.C. Meanwhile, the MAC airlifter that had landed behind us was parked close to the terminal.

When we got inside, there were 30 or so pax waiting to go out on the MAC airlifter. After 20 minutes or so, they began loading pax. We figured the crew just wanted to be ready to "get out of Dodge" as soon as this "classic" thunderstorm broke. At this point, there was thunder and lightning in all quadrants.

Our ride to base ops arrived, and we were on our way there when we saw a LOGAIR Lockheed break out of the weather and touch down on Runway 22.

Our first stop at base ops was the weather shop to look at their radar and get a positive fix on the storms and their movements. The picture was not encouraging. There was a line of thunderstorms tracking in file from the southwest that looked as though they were radar vectored for an ASR into MacDill. Worse yet, they were topping at 36,000 ft!

The forecaster estimated at least two hours before the storms moved northwest enough to allow refueling. Our navs decided to work up two routes home, one over Jacksonville, the other more to the west in case the weather was still in the area.

The navs got busy and the pilots went outside to watch the storm. (In case you haven't been to MacDill, there's a canopy outside the entrance so we weren't standing out there getting wet.) As it turned out, we got to see more than the weather. The first surprise was the LOGAIR taxiing to Runway 22. The second surprise was the MAC airlifter in close trail.

. . . took off with full loads of luck and little else.

The lightning was on the field! Elapsed time from when we'd see the flash until we heard the thundercrack was 6 to 9 seconds. That put the storms at a mile to a mile-and-a-half from base ops. It didn't seem to bother the LOGAIR crew; to our amazement, *they lined up and rolled.* But before they were airborne, two lightning bolts struck very close to the active runway. We figured, surely, that would be enough to encourage the airlifter back to parking—we were wrong!

It only delayed their attempt about 5 minutes. Our guess was they were waiting to see if LOGAIR made it. Since airplane parts and human fragments didn't come floating down from the low clouds, their decision was *go.* As they brought up power to taxi into position, another bolt struck the departure end of 22—*they rolled!*

During their takeoff, another bolt struck the ground behind them, and then lightning struck again

at the departure end as they turned out over the bay. We watched them climb out until we lost sight of their strobes in the clouds. Shocked comments among us ranged from "big ones" to "more lucky than smart." The cells continued their overhead march for two more hours.

We finally got our gas and made it home around 2330, four hours later than planned, and nearly 20 hours since preflight at Mildenhall. Sure, we were tired and would rather have gone on time. But, fuel or no fuel, there was no way we would have launched into that weather system. No mission, no passenger, no cargo, rates that kind of risk.

Maybe as we get older we just become less willing to take unnecessary chances. Maybe we get smarter. Maybe we just have more patience, or maybe we've just read about, heard about, or known enough other guys who took those chances and lost.

That Friday night, a LOGAIR and a MAC airlifter took off with full loads of luck and little else. Common sense and good judgment missed the boarding calls. Fortunately, they lived. Unfortunately, their success only reinforced their thinking that what they did was safe—they didn't die—their craft and innocent passengers weren't toasted by a million volts—the bits and pieces stayed together. They'll sit around the bar and talk about the hairy departure from MacDill; somebody who hears it might even try it; worse yet, maybe they'll try it again themselves. Only next time, they may not have a full load of luck!

To judge an act safe or unsafe, by whether you live or die or damage your airplane, is using some pretty tough criteria. If you guys read this and recognize yourselves, call me collect. I'm still wondering why.

The Director of Safety comments:

Outstanding story! Thanks Bob.

Reflecting on Bob's question—*"why?"*—I thought back a number of years to a similar experience. I was a newly assigned junior lieutenant colonel in the 21 TAS at Clark, scheduled for my theater "dollar-ride" with a brand-new, junior captain IP. Our itinerary was Clark-Andersen-Clark. Inbound Guam, we spotted a line of thunderbumpers; still far enough from the field to allow a comfortable approach, but moving toward the island.

Uh-oh. Here I am, newly assigned, with a wife and three kids living off base at Carmonville; all of us undergoing cultural, heat, and humidity shock—I could see a mild case of get-home-itis coming. By the time we checked weather for our return, it was looking doubtful. When we called from the airplane for our pax, it was raining hard. Thunder, lightning, and "tropical" sheets of rain arrived before the pax bus, and the young AC/IP was clearly concerned.

As we watched nature's spectacular show, a Guam-based WC-130 cranked up, taxied, and departed. *Amazing!*

The IP checked with the CP who asked encouraging questions such as "What's your crew day burnout time?" The departing WC-130 reported "It wasn't that bad," and the weather guys dutifully relayed that PIREP.

By that time, I knew I could turn this off with one word, but instead decided to see how far the young guys in my new organization would go. So, I was totally noncommital. I answered the, "What do you think, sir?" questions with, "Oh, I don't know," and, "It's your decision." That poor IP was in a spot. I could criticize whatever he decided, and he knew it.

That went on for quite awhile until we were within our launch window, and close to burnout, when he said, *"We're not going!"* Then he turned to me with uncertainty in his eyes. I said, "That's not only the right decision, it's the only reasonable decision." He breathed a sigh of relief.

At the hotel, we talked. What if I had fallen victim to a bad case of get-home-itis? What if there were other mission pressures? What about wind shear? Microbursts? Gusting crosswinds? Hydroplaning? Lightning or turbulence? Throw in the possibility of a system failure, combined with violent weather, forcing us into an unrecoverable situation? The WC-130 made it; would we have?

I don't know. Probably. But safety is risk assessment and, with thunderstorms, the probability of failure during takeoff or landing is far too high.

As Maj. Bob Silver points out, risk assessment and no-go decisions get easier with age and experience (and rank, I admit). One of the questions I ask myself about bad weather is, "Would I send my own son?" If the answer is no, then, in my opinion, it's too bad for you, and it's too bad for me. Try it: ask yourself, would I send my son/daughter/wife/brother/girlfriend? After all, you know the world's greatest crewmember—you—can handle anything. Right?

Oh, yes. Back at the squadron and wing, I complimented the aircraft commander's dedication to mission—his wisdom to say *"no,"* when required, despite others' unwise decisions to press on. He appreciated the support.

HUMAN FACTORS: A TOUGH NUT TO CRACK

By Maj. Kent Lee
Chief, Human Factors Studies Branch
HQ MAC/IGFF

Human factors. Seen this term a lot lately? You should have. It's the primary cause of aircraft flight mishaps. In voting terminology, it wins by a landslide—but more on that later.

Human factors (HF) encompass many issues, including one typically known as "pilot error." However, there are many factors which could lead to pilot error. If it sounds like a 'human factors fault' may not lie solely with the pilot, then you're getting the picture.

A major flight mishap investigation calls for thorough human performance analysis. Humans have limits, just like aircraft engines and airframes. To paraphrase Dr. Rob Lee, Assistant Director of Australia's Bureau of Air Safety Investigation, if an aircraft crashes because of an engine related problem, the investigator must determine whether the unsuccessful attempt to recover with max power was within the engine's performance envelope. If using max power should've recovered the aircraft but didn't, then the problem lies elsewhere, (i.e contaminated fuel, etc.). A similar analysis must be done on the pilot. If the demands on the pilot weren't outside his or her envelope, then we must find why he or she failed to function "as advertised." So, simply stating a mishap's cause as pilot error is insufficient. Finding the "whole story" might prevent a future mishap—the REAL purpose of mishap investigation. Incidentally, HF does not apply solely to aircrews. It applies to anyone with a role in the mission, no matter how indirect. Examples include mishaps caused by a wrench left in a throttle quadrant, an air traffic controller vectoring two aircraft into each other, or a supervisor condoning unauthorized flight maneuvers. Scenarios are endless. Nonetheless, the majority of HF-related mishaps are due to operator error. Having said that, let's look more at what HF encompasses.

A simple definition of HF is "the study of physical, physiological, psychological, psychosocial, and pathological limitations of man as he interfaces with his environment." Granted, that's a mouthful of Ps (only three if you exclude the silent ones). A look at each factor:

(1) Physical—One's condition, stamina, and strength. Includes study of body measurements (anthropometrics) to see if, for example, a pilot was capable of applying full rudder necessary for aircraft control following loss of power on one side.

(2) Physiological—Factors which incapacitate, confuse, dull, disorient, or distract. Includes hypoxia, airsickness, hangover, fatigue, poor nutrition, lack of sleep, etc.

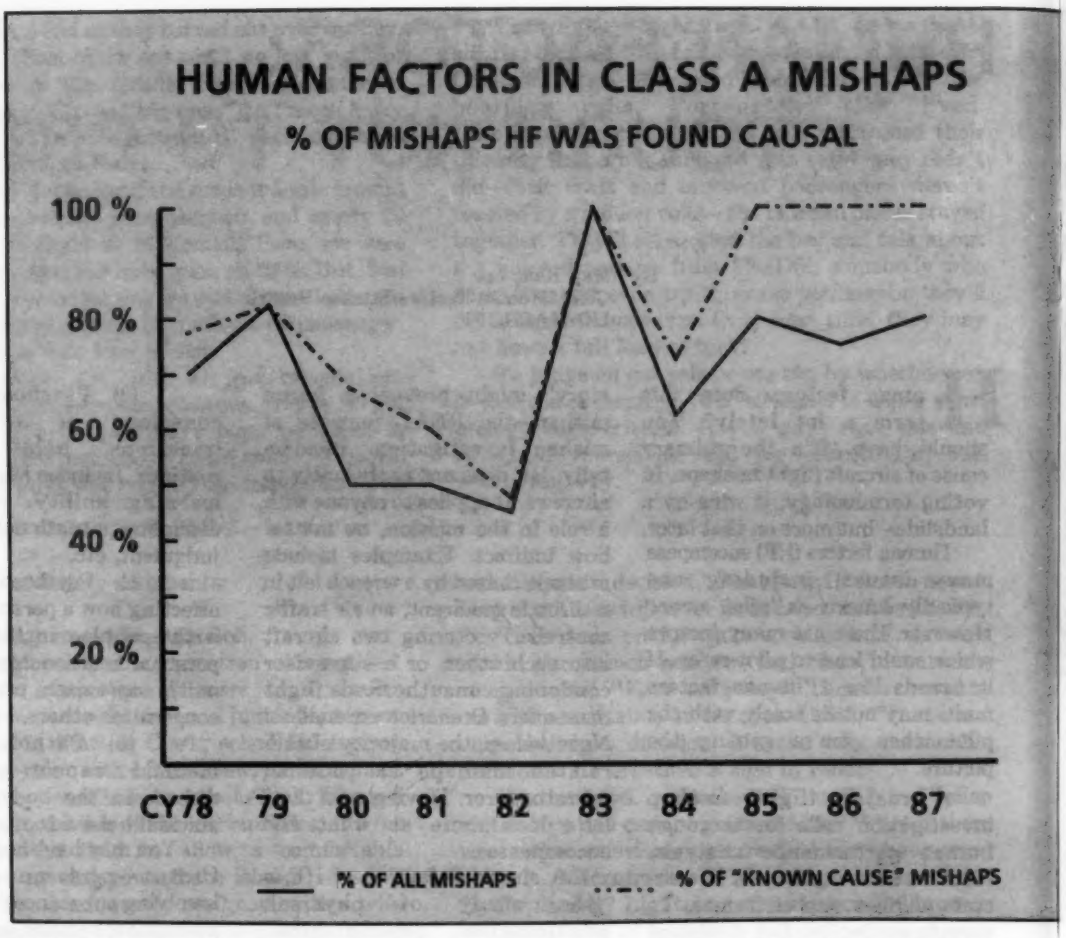
(3) Psychological—Subconscious or preconscious (reactions, habit patterns) routines. Includes attention span, learning ability, motivation, discipline, situational awareness, judgment, etc.

(4) Psychosocial—Factors affecting how a person gets along with people, including interpersonal relationship within the unit, supervisor pressure, ego, concern for others, etc.

(5) Pathological—The medical aspect: pre-existing disease in the body, ear block, suicidal behavior, etc.

You may have heard of a sixth factor—pharmacological—involving substances which affect perception, balance, and alertness, due to alcohol, cigarettes, illicit drugs, medication, etc. These factors are similar to physiological or pathological since they are incapacitating or medically related, so, for simplicity's sake (if it's not too late), we'll leave it at five factors.

Most HF-related mishaps involve psychological factors. Channelized attention, situational awareness, flight discipline, and supervision, just to name a few, invariably end up in many mishap reports. However, a look at USAF and "sister service" incident reports shows other factors surfacing that have long had mishap "cause" potential. For example, insufficient crewrest was



cited in a "collision-with-ground" mishap. Another Class A was attributed to fatigue due to inadequate rest and hangover symptoms—possibly the first time alcohol was cited in a mishap. As a reminder that physiological incidents can be serious, a pilot experiencing loss of pressurization chose to remain at altitude. Over half an hour later, he experienced ill symptoms, landed at a divert base, and died several hours later—tragic, *because it didn't have to happen.*

The chart shows HF (operator/crew) causal in the majority of MAC's active duty Class A mishaps. Why? Today's technology improves upon already extremely reliable aircraft. The environment has also improved with advancements in air traffic control, wind shear detection, etc. However, other than making him more aviation-knowledgable, we're dealing with the same man that climbed aboard the first Wright Flyer. Statistics bear this out. Operators accounted for 67 percent of MAC Class A flight mishaps over the last decade—79 percent the last three years. A comparison of the last five years (CY83-87) with the previous five (CY78-82) shows an increased percentage of HF mishaps. In the last five years, 76 percent of the mishaps were HF compared to 60 percent five years before. However, these figures are based on all Class A mishaps, many of which are "cause undetermined."

A more accurate representation of the HF impact compares percentage of HF mishaps to those with known cause since the "cause undetermined" mishaps create a false statistical impression. For example, 79 percent of the last three years' mishaps were HF-related. This might leave the impresssion the remaining 21 percent were due to other causes (logistics, weather, etc.). In fact, we don't know what caused them because the 21 percent were "cause undetermined." A cause undetermined finding usually results when a

safety investigation board finds no logistics, weather, or other reason for the mishap, and lack of surviving crewmembers significantly hinders HF analysis. The mishap could be HF-related but lacks substantiation. So, for statistical purposes, let's look only at the "known."

Using only "known cause" mishaps, the five-year comparison shows an alarming trend: whereas only 60 percent of the mishaps from CY 78-82 were HF, the figure for the last five years jumps to 90 percent—and *100 percent* the last three years. The difference? Logistics related mishaps of earlier years are leaving the mishap arena to the operators.

So, what are we doing about all this? Glad you asked. Increased emphasis in HF resulted in the 1986 Worldwide Safety Conference recommending each MAJCOM appoint an HF project officer. MAC went beyond that, establishing a Human Factors Studies Branch in the safety directorate. All we need to do now is identify the "mishap personality" and keep him or her out of the flying environment, right? We wish it were that easy. Believe it or not, studies have attempted to identify accident-prone personalities. Dr. Eric Farmer, a human factors specialist at the Royal Air Force Institute of Aviation Medicine, wrote of several studies in the Sep 84 issue of *The International Journal of Aviation Safety*. Results indicated that while the aggressive, sensation-seeking nature of extroverts may lead them into situations exceeding their skill, they are better able to cope with demands imposed on them during difficult phases of flight—more so than the introvert. However, introverts work slowly and carefully and with less probability of error. While research testing indicated a definite "pilot personality," the studies were inconclusive overall.

MAC did a similar study of our mishaps, spanning a ten-year period—approximately 70 accidents. Despite extensive analysis in numerous areas, the MAC study couldn't isolate a mishap personality. The most telling fact from the analysis was that experienced pilots weren't immune to mishaps. The flying time, total and in-type, of mishap pilots was above the MAC average. In fact, instructors and flight examiners accounted for 62 percent of the mishaps. As Dr. Farmer concluded in his article, "It is not yet, and may never be, possible to select pilots on the basis of their likelihood of accident involvement." Despite his conclusion, we're still taking steps to help prevent HF mishaps.

The Air Force Inspection and Safety Center at Norton AFB is seeking funding for the Aircraft Mishap Prevention program, including a computer analysis of all human oriented mishaps. One proposed version would program 844 elements from each mishap. Computerizing several years of mishap data could provide a trend analysis to aid in mishap prevention.

Last October's MAC staff "road show" briefing to most MAC flying units was an initiative to make aircrews aware of HF in our recent mishaps. Feedback from crewmembers during the road show showed fatigue as one of their primary HF concerns. Subsequently, we're looking at the more demanding mission schedules with regard to fatigue indexes used by medical experts. Though long duty days beginning at O'dark-thirty are inherent in our mission, we still hope to benefit aircrews by identifying some problem areas.

The training arena also aids in mishap prevention. The DOT community's Aircrew Coordination Training (ACT) program was a large step in improving situational awareness through increased aircrew interaction. Videotapes like "MAC 249, What Are Your Intentions?" an initiative by 63 MAW, is a valuable addition to ACT.

As of this writing (June), we've enjoyed eight months without a major mishap. Fortunately, two instances where aircraft departed the runway on landing weren't operator error. Still, MAC continues to have operator-induced incidents flirting with catastrophe. One involved a near midair (less than 100 ft) between two converging aircraft attempting SKE formation initiation in IMC. Another incident resulted in two engine failures (on the same side) because the pilot performed prohibited maneuvers during a combat exercise—but then many of our mishaps occur because we violate regulations, checklists, training guidelines, etc.

Despite some close calls, we've done relatively well the last several months. Using CINCMAC's words, this reflects "a superb team effort." But HF mishaps have been part of aviation ever since Dadaelius' son Icarus flew beyond the design limit of his feather and wax wings; as long as we're dealing with people, they will continue to be in the future. Our goal is simply to reduce the number as much as possible—through training, increased awareness—and whatever it takes. You play the largest part in that goal; *you're* the human factor. But, there's a more sobering way of looking at it: next time you're up flying and thinking about "taking a chance," no matter how small, think about what you stand to lose if, to your surprise, your number comes up. ★

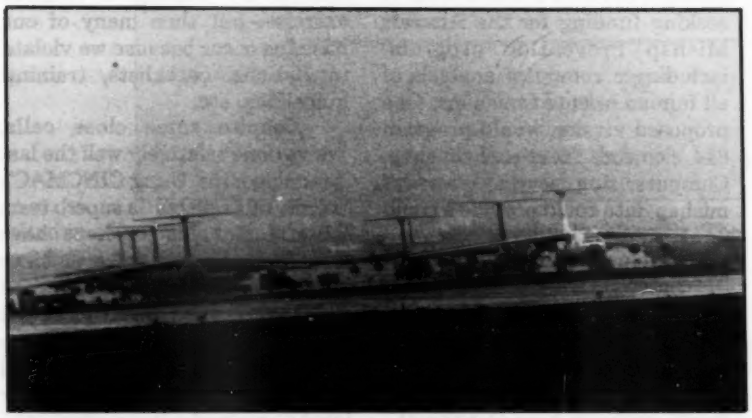
By Maj. Steve McCauley
Associate Editor

McGuire's last remain

Appropria emp

McGuire AFB

On The Leading Edge to NATO



T-tails on the ramp at McGuire.

Wet Starlizzard noses peer from a hangar known as "Big Blue."

Destination: McGuire AFB, New Jersey; home of the 438 MAW.

Assignment: Study and report on some of the unique and interesting aspects of the wing, its mission, and its flight safety challenges.

A quick glance at a map depicting U.S. military installations shows McGuire situated in anything but a remote location. Snugly nestled in the urban Northeast, this base appears encompassed by the metropolitan areas of Philadelphia; Washington, D.C.; and Newark (almost a major suburb of "The Big Apple"). It's only a one-hour drive from McGuire to a great many metropolitan areas. Surrounded by gently rolling, wooded landscape, it's quietly isolated in a green patch of terrain

re's last remaining C-118.

Appropriate emphasis.

known as the "Pine Barrens." Because of such apparent solitude, a visitor must constantly be reminded that over twelve and one half million people live within a 150 mile radius of the base!

A quick review of McGuire AFB history and mission is in order prior to any in-depth study of its people and what motivates them to *"acquire the McGuire desire."* So, drawing from my own intensive "sip from a fire hydrant" study of that topic, here goes:

McGuire AFB is known as the "All American Air Force Base;" an appropriate slogan, considering its location and mission. Besides being home of the 438 MAW, the base is host to 49 tenant units, including Headquarters, 21st AF; the 514 MAW Associate Reserve; and Headquarters, New Jersey Air National Guard.

McGuire had its beginnings in 1937 as Rudd Field, under control of Ft. Dix. In 1949, it was renamed McGuire Air Force Base in honor of the New Jersey native and number two air ace in American history—Maj. Thomas B. McGuire, Jr. Over the years, planes assigned to the airfield included A-25, B-24, C-47, C-54, C-118, C-135, C-130, and C-141 aircraft. The 438 MAW has been at McGuire since 1966, flying the C-141 Starlifter, the first jet aircraft specifically designed to carry military cargo and troops. With adaptation of air refueling capability and addition of 23 ft of fuselage, the C-141 "B-model" made its debut at McGuire in 1979. Able to carry the majority of vehicle types in the U.S. military inventory, it can move loads of almost 70,000 lbs between continents at speeds close to 600 miles per hour.

The mission of the 438 MAW is the MAC mission—to maintain a trained and ready force with capability to airlift and resupply forces anywhere in the world. The wing must be able to provide quick reacting, concentrated airlift; put military forces into combat situations; and furnish those forces with the supplies they need to stay there. Actively performing that mission, even in peacetime, they fly over 2,000 tons of cargo out of McGuire each month.

The wing's 750 crewmembers are assigned to one of three active duty squadrons—the 6th, 18th, or 30th Military Airlift Squadron. They're augmented by reserve crewmembers from the 514 MAW who meet the same stringent training requirements as their active duty counterparts. During a given year, 438th crews fly more than 63,000 hours on missions to more than 50 countries. Of noteworthy importance to the McGuire operation is Det 1, 438 MAW, located on the Canadian Air Base at Goose Bay, Labrador. This small group of 438th people provides vital en route support for MAC aircraft, airlifting troops and supplies to Europe.

Enough thumbnail sketching. Let's talk about *flight safety* at McGuire. Upon my arrival at that mecca for the venerable C-141 Starlifter, I met Lt. Col. Donald H. Stallings, Chief of Wing Safety. He immediately pointed out that the real Chief of Wing Safety is his Wing Commander, Col. Frank M. Pearce; the safety staff's role is to *implement* the wing commander's safety program.

Moving along to the burning question on my mind, I asked my host to describe any missions or safety challenges unique to the 438th. His immediate response was, "The weather." Compared to other MAC bases, the dues the 438th pays for its convenient location entails seasonal removal of cold, white, slushy stuff from those flat paved surfaces which modern aircraft have grown dependent upon. "On many winter days," said the colonel, "the ground at Dover and Andrews will be clear, while McGuire struggles to cope with a foot or more of snow."

Referring to their special taskings, Colonel Stallings explained the wing enjoys a vast array of "high visibility" missions including VOLANT BANNER (presidential airlift support), VOLANT SILVER (vice-presidential airlift support), and a unique brand of mission affectionately known only as "The Heavies."

A look at the daily flying schedule revealed a "heavy mission" line for which all cargo and destination info was classified only as "XXXX." Such missions are so important that the scheduled aircraft is sealed and the crew isolated for 24 hours prior to

Fun tunnels. Chemical Warfare Training Obstacle Course.

the mission. Furthermore, a backup aircraft and crew is always committed, using the same precautions, to ensure 100% reliability for each "Heavy." My inquiring mind immediately returned to neutral gear when Colonel Stallings cautioned, "If I tell you any more about 'The Heavies' I'll have to shoot you!"

I was next invited to the 438th wing safety meeting, and I gladly accepted. I could hardly decline, since the guest speaker was the MAC IG, Brig. Gen. Floyd E. Hargrove. Not so coincidentally, General Hargrove is also **THE** Chief Editor of *TMF*. The meeting location was a spacious auditorium facility in the Airevac squadron building, with just enough seats to accommodate the nearly 200 airlifters in attendance. A principal agenda item for the meeting was presentation of the MAC Flight Safety Achievement Award, in recognition of another mishap-free year. In fact, as of this writing, the wing has accumulated an impressive record of over 300,000 consecutive mishap-free flying hours.

The meeting lasted for about an hour, and then my hosts invited me to join them in a quick trip to the place where people at McGuire go to get gassed—literally! It was a ribbon cutting ceremony for the Chemical Warfare Training Obstacle Course. A facility unique in MAC, the course exposes students to simulated chemical combat field conditions to increase familiarity with chemical warfare defense equipment and its limitations. Personal initiative by McGuire's own people conceived, designed, and built this obstacle course complete with water hazards, rope swings, drainage tunnels, and other fun tests of stamina. You may think it takes a very determined masochist to try to prove his grit here in full chemical warfare gear! Such an assumption would be only partly correct, since the McGuire course instructors emphasize *survival*—the key to warfighting in a chemical environment.

Next stop was the base air traffic control tower for a bird's eye view of the airdrome and surrounding terrain. Indeed, most of the real estate which surrounds McGuire is "occupied" by Ft. Dix—an appropriate metaphor, considering it's a U.S. Army basic training center. Capt. Gary Ellsworth showed the way to the top aboard the tower *elevator*! Their elevator even has *polished brass* panels and hardware! Rest assured, McGuire is not a joint use (civil/military) airfield. The air traffic services (ATS) function, however, is a "Level III facility." That means it's a very busy place, considering they work with Philadelpia Approach Control and funnel most overhead traffic (83 percent civilian) into JFK, Newark, or Atlantic City. Then there are 13 more satellite airfields in the vicinity of the base, all of which must call McGuire for clearances. The Robbinsville VORTAC (RBV), located only 15NM northeast of McGuire, is described as the "busiest air traffic control crossing point in CONUS." This may be partly attributed to the fact there are more than 500 registered aircraft per thousand square miles in the

State of New Jersey—the highest density for any state in the Union!

The McGuire airdrome itself has more than just the standard quota of C-141s assigned to an airlift wing. It also plays host to an ANG tanker group (170 AREFG with KC-135s and one C-130), an ANG fighter wing (108 TFW with F-4s), and a plethora of bug smashers sponsored by one of the largest aero clubs at any Air Force base. I was impressed by the volume and density of aircraft, and couldn't avoid remarking on the certain impact on flight safety. The McGuire ATS folks quickly reminded me that, although they support an FAA function, their primary mission is to help assigned aircraft "get that on-time departure and enjoy a safe return."

Whenever I inquired as to the "most unique" aspect of McGuire's mission, the response was always the same: *nuclear airlift*. People at this wing take pride in this very serious responsibility. Capt. Martin D. Potash, Nuclear Surety Officer, offered the following: "Nuclear airlift is one of the most critical missions in MAC, and the most important mission performed by the 438th. Prime Nuclear Airlift Force (PNAF) aircrews are hand picked by supervisors after careful screening. Once selected, an individual is certified under the Personal Reliability Program (PRP) and entered into an extensive training program."

Concerning the total impact of those missions for the wing, Captain Potash says, "Over 30 base agencies support McGuire's nuclear mission. Each of those units is tasked to specially train every man or woman involved in nuclear airlift support. Maintenance must select airframes based on maintenance history and aircraft status to insure suitability for the mission. The aircraft is then prepared and inspected according to MACR 55-18, which imposes greater restrictions than required for normal missions. In effect, tolerances are *one half* those normally allowed; a normally permissible one-inch cut limit on a tire would be reduced to only one half-inch for PNAF missions. Furthermore, a backup aircraft, meeting the same restrictions, must also be available." With so many precautions for added insurance, it's no wonder the wing boasts greater than 99 percent reliability in launching its PNAF missions!

McGuire aircrews are also totally involved in the aerial delivery business. Members of the 18 and 30 MAS constantly train to maintain proficiency in all aspects of aerial delivery, including SOLL I. With McGuire's only local drop zone right beneath a major airway, however, safety demands extra attention.

While visiting flying squadrons tasked with special airlift missions other than PNAF, I couldn't help being impressed with what they consider their most important safety asset, the *aircrews*, fully capable of handling any situation on very sensitive missions. Capt. Scott Dunlap, 18 MAS Safety Officer, remarked, "We practice aggressive safety by having a strong *squadron* program. We keep crews involved in safety by keeping them well informed, and our safety meetings are designed for both entertainment and education. We invite guest speakers or have our own crews share personal war stories."

Chief Master Sergeant Mattox, a well traveled squadron flight engineer, volunteered his perceptions on the greatest safety challenges for McGuire flying units. "We have to work *twice* as hard to do our mission here. The high frequency of quick trips often cuts our crew rest. We go out and do it. Then, when we get back, we go out and do it again. We have old, high time airplanes being operated by low time flyers. Still, the guys use their brains and common sense, and they keep the mission moving." Another interesting safety factor the Chief pointed out is the "2,000-hour rule." Though it's really a wing policy "guideline," schedulers must insure at least 2,000 hours of total C-141 flight experience between the two pilots on a normal crew. The same guidance applies for flight engineers.

I would have liked to talk more with the men and women of the 438th, but those people really are busy with the daily press of responsibilities and mission activities. In fact, just prior to "departing the fix outbound," a quick pass by the safety office to offer a final thank you to my hosts demonstrated just how busy they are—couldn't find them in their office because they were out doing their safety job. So I'll just add a word of appreciation here for the "grand tour" so graciously provided by flight safety officers Maj. Chet Trosky and Captains Jeff Watson and Max Hart. As an historical sidenote, Major Trosky has one of the most unique (but not enviable) flight safety credentials in MAC: He once landed a C-141 with only two engines operating—and those on only one side of the aircraft! (see *TMF*, Feb 1978.)

As my visit came to a close and this writing deadline loomed ever closer on the horizon, I reflected on how positive, courteous, and downright helpful all the support people at McGuire are. They prove that it really isn't so much a matter of base location, weather, or physical facilities which make McGuire a good place to work. It's the people and their attitude towards their mission—*safe and effective.*

Low O_2 Endangers Crew

Passive Smoking Hazards

By Dr. Alan R. Kahn

As a pilot, physician, biomedical engineer, and ex-Air Force flight surgeon, I'm naturally interested in the question of aircraft cabin environments and their effects on human physiology. Recently, I helped develop a small, portable device called an oximeter, used for non-invasive monitoring of the oxygen content of human arterial blood.

In the course of my travels, I used the oximeter to measure blood oxygen levels of 41 passengers and crewmembers during commercial airline flights. I also employed a portable altimeter to measure pressure altitude in the aircraft cabin. The data I recorded clearly indicates to me a significant problem exists in commercial aircraft cabin environments. The graph shows the relationship between cabin altitude and oxygen saturation in arterial blood during these commercial flights. The data paints a clear picture of the marked effect of increased cabin altitude (decreased cabin pressure) on available oxygen in the blood of passengers and crew.

This diminished blood oxygen level has significant implications for crew performance and the well-being of elderly passengers and those with cardiac and respiratory ailments. These concerns are compounded by the effects of cigarette smoke in the atmosphere.

The problem is, not only does cigarette smoke produce particulate matter which causes cardiac and pulmonary diseases as well as cancer, it produces significant amounts of carbon monoxide gas. Carbon monoxide vigorously combines with hemoglobin in the blood, occupying sites which would otherwise carry oxygen.

In smokers and others subjected to high smoke levels, three to five percent of the hemoglobin is locked up with carbon monoxide. Add this effect to the already diminished oxygen saturation caused by high altitude and a potentially dangerous situation develops. For example, smokers and crew who work in aircraft smoking areas with a cabin altitude around 8,000 ft can have effective oxygen saturation levels as low as 85 percent.

Oxygen saturation levels below 85 percent are cause for concern in hospital patients. Oximeters are usually set to warn medical staff of values less than 85 percent so they can take appropriate remedial actions. Yet, this condition occurs regularly in commercial aircraft among passengers and crew in smoking environments.

Lower oxygen saturation levels are more likely to occur in persons who are over 50 years old, overweight, or have cardiac or pulmonary diseases. Passengers are probably the least affected by low blood oxygen saturation because they aren't active and thus have lower oxygen needs.

This, however, isn't true for the crew who are working and, in the case of flight attendants, performing physical tasks with few breaks which would necessitate substantially greater oxygen needs. In fact, flight attendants working in smoking sections frequently complain of nausea and dizziness.

Pilots are also affected by low blood oxygen saturations. There's ample evidence that oxygen saturation values below 90 percent significantly reduce a person's ability to exercise good judgment. These lower values are likely to occur in older and more experienced pilots who are usually in command.

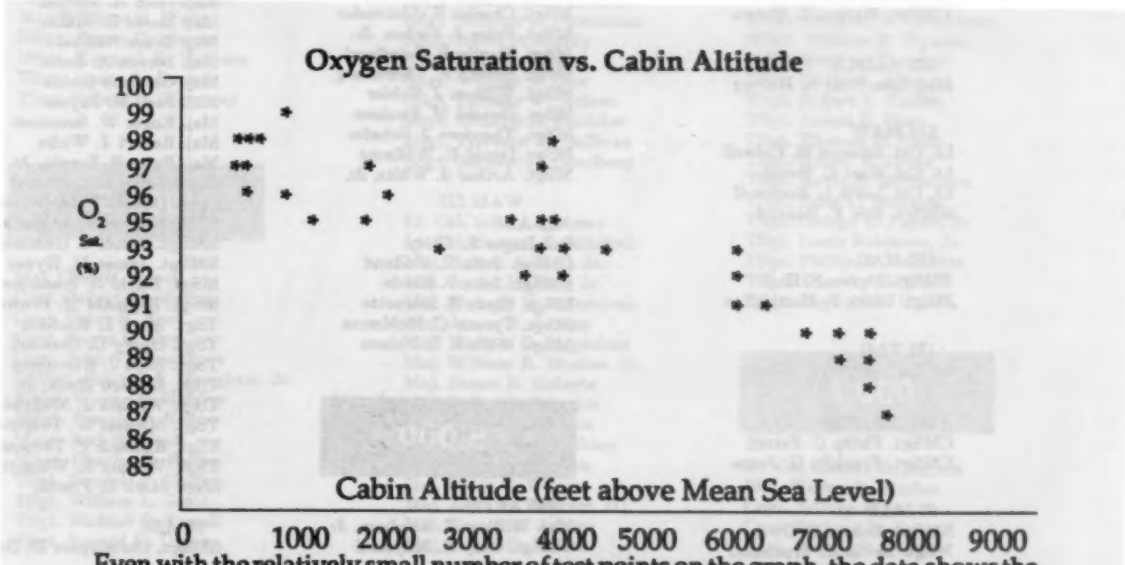
Pilots I interviewed reported they don't use supplemental oxygen during level flight. Some do use oxygen for a few minutes during descent before landing. Breathing supplemental oxygen for a few brief minutes during descent isn't sufficient to replace depleted oxygen in the body's tissues. Thus, pilot's judgment during this phase of flight is questionable.

Possible remedies for this include: (1) better cabin pressurization to assure cabin altitudes never exceed 6,000 ft; (2) adequate protocols requiring pilots use supplemental oxygen and; (3) banning smoking during flight, especially long flights cruising at high altitudes.

(*Editor's Comments:* Although discussing commercial aircraft, similar circumstances apply to MAC aircraft cabins and flight decks. In response to recent FAA rules, MAC prohibits smoking on flights less than two hours long, and on all medical evacuation flights. If you're a crewmember and smoker, we at *TMF* strongly urge you to quit. It can only help you, your family, other crewmembers, and the passengers you fly with.) ✈

Adapted from: *The Aviation Safety Monitor*

Dr. Alan R. Kahn is a physician with 33 years experience applying biomedical engineering to clinical uses. His current activities include consulting and applying new research in brain physiology to artificial intelligence, human behavior, and communications. Dr. Kahn has 10 patents and more than 70 scientific publications and presentations to his credit.



Even with the relatively small number of test points on the graph, the data shows the profound effect of increased cabin altitude (decresed cabin pressure) on the oxygen available in the circulating blood of passengers and crew.

Flying-Hour Milestones

15,000

86 MAS
Lt. Col. Patrick J. O'Donnell

10,000

21 AF
Maj. Gen. Donald A. Logeais, 21 AF/CC

Col. Shellie M. Bailey, Jr. 172 MAG
Col. Robin S. Purdie, HQ MAC/DOV
MSgt. Bobby L. Atkinson, 335 MAW

143 TAG
SMSgt. Chester C. Zuromski

7,500

23 AF
Maj. John R. L. Sullivan
CMSgt. Marion E. Moretz

322 ALD/CC
Maj. Gen. Paul A. Harvey

512 MAW
Lt. Col. Edward M. Colwell
Lt. Col. Kurt C. Novak
Lt. Col. Lorin L. Rockwell
SMSgt. Eric F. Renaud

172 MAG
SMSgt. Duane F. Hall
MSgt. Larry B. Herrington

135 TAG
Lt. Col. Vernon A. Savier

HQ MAC/DO
CMSgt. Philip C. Ferrell
CMSgt. Franklin G. Jones

97 MAS
SMSgt. Robert E. Owen
MSgt. David K. Trueblood

167 TAG
Lt. Col. Jimmy D. Bail
Lt. Col. Paul Gibbons
Lt. Col. William K. Swarthout
Lt. Col. Edwin B. Kuempel
CMSgt. Gary D. Albright
MSgt. Richard L. Zirk
MSgt. Bobby D. McBee

928 TAG
Lt. Col. Stanley L. Brown
SMSgt. David E. Hegy

21 AF
Col. Clinton L. Noren
Col. Joseph A. Petrazio, Jr.
Lt. Col. Peter A. Filandro
Lt. Col. James E. Peel
Lt. Col. Roland L. Wolfe, Jr.
Maj. Raul Contreras
CMSgt. John L. Dodds
CMSgt. Richard L. Pothier
CMSgt. Paul E. Roy, Jr.
CMSgt. Phillip E. Schutz
CMSgt. Carl L. Sellers
SMSgt. Gary R. Briscoe
SMSgt. Thomas F. Diaz
SMSgt. James P. Dotson
SMSgt. Joseph R. Ochranek
SMSgt. Frederick G. Webb
MSgt. Charles S. Alexander
MSgt. Peter J. Forbes, Jr.
MSgt. Martin P. Friedland
MSgt. Steven A. Thornburg
MSgt. William J. Tobler
MSgt. Donald M. Paulsen
MSgt. Theodore J. Schafer
MSgt. David E. Williams
MSgt. Arthur J. White, Jr.

22 AF
Col. Roger R. Utley
CMSgt. John R. Holland
SMSgt. John J. Hinds
MSgt. Clyde E. Burnette
MSgt. Tyrone C. McManus
MSgt. William C. Nelson

5,000

939 ARRG
Maj. William E. Scarboro, Jr.
SMSgt. Gary R. Maynard

94TAW
Maj. Joseph A. Pitasi

315 MAW
TSgt. Andrew L. Fox

118 TAW
Lt. Col. Henry M. Gaither, III.
Maj. Elwyn R. Harris, Jr.
Maj. James A. Frye
MSgt. Ralph K. Barrett
MSgt. James M. Bumpus
MSgt. Herbert A. Hedgepath
MSgt. Marvin J. Layne
MSgt. Richard C. Smithson

21 AF
Col. Felix F. Moran, III.
Lt. Col. Ronald E. Bukevicz
Lt. Col. Jack G. Griffith
Lt. Col. Dean Huntington
Lt. Col. Darrel A. Massey
Lt. Col. Clark J. Sprinkle
Lt. Col. John Teske
Maj. John S. Chase
Maj. John L. Cirafici
Maj. Albert Durning
Maj. David B. Ingersoll
Maj. James W. Johnson
Maj. John A. Morgan
Maj. David B. Mullis
Maj. Bruce Nichols
Maj. Steven A. Seats
Maj. Garrison Smith
Maj. Jack M. Snyder
Maj. Roger W. Sorenson
Maj. Robert J. Wicke
Maj. Peter P. Zapalo, Jr.
Capt. Barry E. Gottshall
Capt. Donald P. McDermott
CMSgt. Howard A. Hadley
SMSgt. James I. Gummere
SMSgt. James M. Hynes
MSgt. David N. Anderson
MSgt. Reginald M. Browne
TSgt. Mark L. Buchner
TSgt. Henry G. Crannell
TSgt. Leon J. Kurcewicz
TSgt. Edward Mack, Jr.
TSgt. William J. Niedzwiecki
TSgt. Michael W. Tedford
TSgt. Kenneth P. Thomas
TSgt. William R. Wingett
SSgt. Mark E. French

65 AES
SMSgt. Christopher D. Baird

172 MAG
SMSgt. Duane F. Hall
MSgt. Larry B. Herrington

322 ALD
Maj. Gen. Paul A. Harvey, 322 ALD/CC

911 TAG
MSgt. Charles P. Koerber

710 MAS
Maj. Robert L. Swanson, Jr.
SMSgt. Benjamin Clark, Jr.
TSgt. William C. Striler

312 MAS
Maj. Glen D. Woolen
MSgt. Maurice W. Harold
TSgt. Robert N. Jensen

96 TAS
Maj. Rogers V. Hemphill
SMSgt. Roger N. Schaar
MSg. William J. Pavlicek

313 MAS
Maj. Edwin A. Sechez

301 MAS
Maj. Jeffery W. Bryant
Maj. William C. Drennan
Maj. Martin G. Palagi
TSgt. Donald W. Hopkins

728 MAS
Lt. Col. Brent F. Baughn
Lt. Col. Wayne E. Warden
Maj. Kenneth L. Doekocil
Maj. William L. Hammond, Jr.
Maj. Jack W. Linet
Maj. Gary M. Pennington
Maj. William G. Wade
MSgt. Bruno Guitierrez
MSgt. Kenneth D. McHone
TSgt. James A. Bounds
TSgt. Robert E. Weremay

2,500

Maj. Glen H. Jones
Capt. Robert M. Bartgis
Capt. Peter R. Rach
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MSgt. Wayne E. Helsley
MSgt. Donald F. Rohrer
Msgt. Earl W. Cook
MSgt. Charles R. Burke
TSgt. Randall P. Shafer
TSgt. William L. Scott
TSgt. Michael B. Ferrell
TSgt. Ronald D. Unger
SSgt. Howard C. Shearer

22 AF
Col. Donald E. Loranger, Jr.
Col. Terry L. Thompson
Lt. Col. Burton V. Hammond, III.
Lt. Col. Robert W. Topel

23 AF
Col. Robert E. Thomas
Lt. Col. Thomas J. Doherty
Lt. Col. Terry R. Silvester
Lt. Col. Richard L. Umbarger
Lt. Col. Victor D. Jaroch
Lt. Col. Timothy E. Shafer
Lt. Col. Thomas J. Stephenson
Maj. Thomas W. Hermanson
Maj. Stephen E. Behr
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Capt. Sherman G. Pulmano
Capt. Kevin G. Ryan
Capt. John C. Sleight
Capt. David M. Smith
Capt. David B. Tagert
CMSgt. James D. Bourcier
CMSgt. Charley D. Majors
MSgt. Chadwick L. Straight
MSgt. Gary S. Ellego
MSgt. Michael C. Jolly
TSgt. Everett W. Kulse, Jr.
TSgt. Alan M. Schrantz
SSgt. Charles M. Faulkner
SSgt. William C. Guerttman
SSgt. David A. Hardy
SSgt. Tony A. Kyle
SSgt. William S. Lion
SSgt. Thomas W. Nelson
SSgt. Richard A. Renicker
SSgt. Terrence M. Sullivan
SSgt. Michael G. Sundberg

512 MAW
Lt. Col. John L. Adams
Lt. Col. Samuel C. Mitchell
Maj. Robert A. Bell, Jr.
Maj. James R. Bird, Jr.
Maj. Richard W. Johnstone
Maj. James V. Jordan
Maj. Wallace C. Magathan
Maj. William R. Moebes, Jr.
Maj. James B. Roberts
Maj. Roger A. Schmidt
Maj. Thomas R. Toula
Maj. Warren A. Weakley
Maj. Robert D. Welsh
Maj. Kelty C. Wilson
Maj. John H. Wolaver, III.
Maj. Gerald D. Alborn
Maj. James D. Brown
Maj. Charles E. Corbett, Jr.
Maj. Raymond R. Jeanes, Jr.
Maj. Roy F. Johnson
Maj. Gary W. Mann
Maj. Gary P. Martin
Maj. Donald T. Milkavitch
Maj. James H. Monbeck
Maj. Anthony L. Vallillo
Maj. Mark A. White
Capt. Carlos R. Carnuda, Jr.
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Capt. Charles K. Hippler
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Capt. Gregory Meirs
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Capt. James W. Plummer
Capt. Brian R. Russell
Capt. Keith C. Wilson
SMSgt. Ronald G. Lobach
SMSgt. Michael W. Rohrbach
MSgt. Gerald D. Allen
MSgt. Gary E. Auld
MSgt. Maynard H. J. Baker
MSgt. David E. Burke
MSgt. Phillip H. Brand
MSgt. Robert M. Cust, III.
MSgt. Phillip W. Dunn
MSgt. Maurice G. Evans
MSgt. Gary W. Finch
MSgt. Nevin W. Lowdermilk
MSgt. Syndey Redmond
MSgt. Herschel E. Rollins
MSgt. Peter A. Stevens
MSgt. Dee H. Stockton, Jr.
MSgt. Edwin R. Sullivan, Jr.
MSgt. Richard G. Teaney
MSgt. Douglas W. Weinmann
MSgt. William R. Wyman
MSgt. Paul A. Yannucci
TSgt. David A. Allen
TSgt. Robert L. Collins
TSgt. James E. Dean
TSgt. Thomas M. Giles
TSgt. Albert E. Lucas
TSgt. Kevin S. McNamara
TSgt. Prior C. Maxwell
TSgt. George L. Payne, Jr.
TSgt. Louis Robinson, Jr.
TSgt. Phillip W. Sabatine
TSgt. Timothy E. Ward
TSgt. Raynold P. Wilson

1,000

Lt. Col. Robert O. Burton
Maj. Wayne R. Washer
Capt. Jeffrey Illig
Capt. Richard D. Beery
Capt. Joseph E. Oscilia

Ranks and units are those at time of award. ★

The One That Got Away . . .

"Watch him, Mac, he's goin' under the boat," yelled Capt. Jack Riley as the big bass on the end of Mac MacKenzie's line headed for the bottom of the lake. "Careful, he's comin' back up. That's it, a little more this way. C'mon baby, in the net. Got 'im! Man, he's a beauty. Eight pounds at least."

"Yeah, I haven't seen one like that in a while. He really put up a fight," replied Mac. "Let's see, 8 pounds, 4 ounces on the old scale.

May get hooked another day.

Okay, big fellow, back in the lake. Go find mama and make lots of little bass," he said as he gently slid the big fish back in the lake.

"Now, Jack, where was I when we were so pleasantly interrupted? Oh yeah, communication. How one little failure to communicate what may seem insignificant information can lead to big problems."

"Okay, just don't talk too loud, you'll scare the fish. And pass me a silver bullet," said Jack as he flipped his pig and jig under some low-hanging branches.

"Here. You sure you know what a bass looks like? You're down three to zip already."

"Yeah, yeah. Just shut up and talk, or something like that."

"Just remain calm. I got this stuff from a couple of mishap reports last week, and since you're heading off to safety school next month, I thought it was good info to pass on so you could see the kind of minor screw-ups that can cause mishaps."

"Okay, wha . . . There he is . . . Got . . . Arrgh . . . Missed "im . . . °%$**(#°+!"

"Why Jack, I never knew you had such a colorful vocabulary. Anyway, the first was a taxi incident. Seems this C-130 crew landed at night, at an unfamiliar airport, and requested progressive taxi instructions. They were directed to the east entrance of the ramp. That's where what I'll call the 'precipitating communications failure' comes in. The local FBO requested the C-130 be directed to the west ramp entrance, but the message wasn't passed to the appropriate controller. The ramp and parking area weren't well lit, and the taxiway surface was about 2 ft lower than the aircraft parking surface. The AC stopped prior to entering the ramp and commented he *thought* there'd be enough room to get by the parked airplanes if he moved to the right of the taxiway centerline. He did just that, as three civilian marshallers signalled the airplane forward. The C-130 started moving slowly forward with the nav and copilot clearing the right side and the AC and loadmaster clearing the left. The engineer was in his seat looking out front. No one mentioned any problem clearing a light plane off the left wing. The AC was following the marshalling signals and looked left just as the wing passed over and contacted a light plane's rudder. The AC stopped just as the marshaller gave a stop signal by raising both lighted wands to a parallel, vertical position."

"Whaddya mean, parallel and vertical?" asked Jack as he changed lures for the third time in 15 minutes. "That's not a stop signal."

"It is to civilians. The Airman's Information Manual says it is, but our reg 60-11 approximates it as 'guide on me.' There were a lot of factors contributing to this one. The ramp was poorly lit, small, and crowded. The taxiway curved left and possibly gave the AC the illusion of adequate clearance while actually leading the airplane closer to the parked airplanes. Civilian marshallers have absolutely no clearance criteria; if you can clear something, press on whether you clear by two inches or two miles. But all these things were beyond the crew's control. What they could control was their own sense of caution and common sense. If it looks iffy, get someone on the ground that can guide by *our*

standards. A few minutes and a few pounds of gas are a small price to pay if something looks squirrelly enough to set off your internal alarm bells. Also, if . . . Whoops, there's one . . . Get the net, Jack . . . Here he comes . . . Hey, not bad, three—no, three and a half."

"Yeah, not bad, purple worm huh," said Jack under his breath as he began rummaging through his tackle box.

"Well, the second and final lesson for the day took place in a formation of three C-141s. They took off in VFR formation in nice VMC conditions. However, shortly after level off, Lead saw they were about to enter a cloud layer. The lead AC, an IP, directed the formation to 'assume SKE spacing now,' instead of saying 'execute inadvertent weather penetration.' His miscommunication, in the form of nonstandard terminology, set the mishap wheels in motion.

"Two reduced power and began to drift back from 2,000 to 4,000 ft, and made a slight right turn. Three made an immediate 30-degree turn, reduced power, and began drifting back to 8,000 ft from Lead. Also, on Lead's command, Two's AC directed his nav to reset the SKE to 500 ft right cross-track, 4,000 ft in trail and the proximity warning to 2,000 feet. Two's copilot *thought* he'd been directed to change range markers on the SKE display from 2,000-ft range rings to 4,000-ft range rings. He made the change without telling the pilot. So Two continued drifting back to what the pilot thought was 4,000 ft from Lead when in fact he was drifting back to 8,000 ft, the same position Three was moving to. Well, it's not hard to see that imprecise communication from Lead and no communication on Two's flight deck set up a pretty hairy situation.

"As can be expected, the proximity warning sounded when Two and Three got within 1,000 ft of each other. Two turned left while looking out the window for Three, and sure enough, there he was. Two pulled back on the yoke and pushed in the power. Three got a proximity warning and looked to his right and saw Two heading right at him. He pushed down, turned right and went under Two. They figure they came within 50 to 100 ft of each other. Two overboosted all four engines—probably his own internal plumbing, too."

"Formation requires you to fly the other guy's airplane a little, too."

"Boy, they really screwed up, didn't they?" said Jack.

"Well, don't be too hard on them, Jack. We all depend on each other to do our jobs correctly, and we don't like to check each other's every action. It's just that in formation we have to expand our idea of what is the proper level of communication. In this case, everybody can share the booby prize. Lead began the confusion by using nonstandard terminology to disperse the formation and failed to adequately monitor his wingmen's position. His station-keeping equipment correctly showed the other airplanes' positions, but he *assumed* it was wrong. Failure to communicate let the problem develop. Deputy Lead failed to communicate his problem when he went into IMC. He should have performed an emergency weather penetration. His copilot failed to communicate the fact he changed the setting on the station-keeping equipment. Three also failed to notify Lead when he entered IMC. Furthermore, he should have performed an emergency weather penetration and failed to monitor Two's position relative to his."

"So they failed the crew coordination test, right?" asked Jack.

"More than that, they failed the *'crews'* coordination test," replied Mac. "Formation requires you to fly the other guy's airplane a little, too. You have to stay aware of the total situation."

"Well, that sure sounds right, and . . . Whoa! I got one this time, Mac . . . Look at him go!"

"Take it easy, Jack. Don't horse him. Lead him over here."

"Can you see him? How big a big mouth is it?"

"There he is. Well, he's got a big mouth all right. But it's the first bass I've seen with big yellow scales and whiskers. It's a carp, Jack."

With that news, Jack Riley grabbed his filet knife and cut his line. "That's it, MacKenzie. Next time we go carp fishing. Maybe then I'll be able to catch a bass with you along."

"Maybe, Jack. Maybe."

GLOBAL NOTES

Lt. Col. Rivers

TMF is pleased to announce a new addition—to the MAC safety staff that is. Lieutenant Colonel (Colonel Select) Alfred C. Rivers is the new Deputy Director of Safety. He replaces Colonel Gary B. Koch, who assumes duties as the Deputy Director of Inspection.

Colonel Rivers joins us from Norton AFB, California, where he most recently served as special assistant to the 63 MAW vice commander. A command pilot with over 7,050 flying hours, his military career has followed an enviable operational path; flying duties connected with every job. Earning his commission through ROTC at the University of Alabama, he completed pilot training at Craig AFB, Ala., in 1968. Following an assignment to Vietnam in EC-47s, he moved to Wright Patterson AFB, Oh., to serve in a variety of safety positions, including safety inspector on the AFLC IG team. Assigned to Norton AFB, Calif., since 1980, he has served in operational positions which included squadron safety officer, chief pilot, assistant squadron operations officer, chief of wing current operations, squadron operations officer, and 14 MAS commander.

TMF welcomes Colonel Rivers to Scott AFB and we bid Colonel Koch a fond farewell with hopes he will continue as a prolific contributor to future issues of *The MAC Flyer*. (Since Colonel Koch will be moving right down the hall from us, we feel confident he will continue to keep an interested and "watchful eye" on us.)

QUICKSTOPPERS

BEWARE OF FLYING CARPETS

One more from *Callback* . . .

Amenities provided aircraft passengers aren't usually hazardous. Here is one exception . . .

"Line service placed a small carpet on the ground under the passenger door. Later, when the right engine started, prop wash picked up the carpet which happened to catch on the step. The carpet remained hung on the step during taxi and takeoff roll. At rotation the carpet came free of the step and caught on the right horizontal stabilizer. At this time I was about 10 ft above the runway experiencing small but unexplained pitch fluctuations. Interruption of airflow over the elevator was my first indication of a problem. I considered aborting takeoff, but the aircraft immediately returned to stable flight with no further incident.

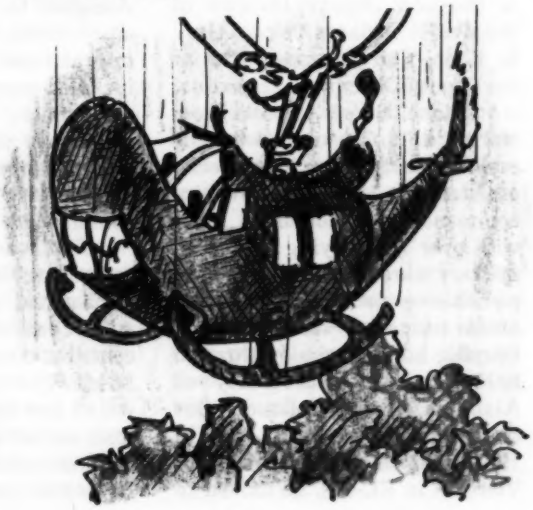
"Now that I know how the problem occurred, whenever I remove the chocks or check that they have been removed, I also check that the carpet was moved clear of the aircraft."

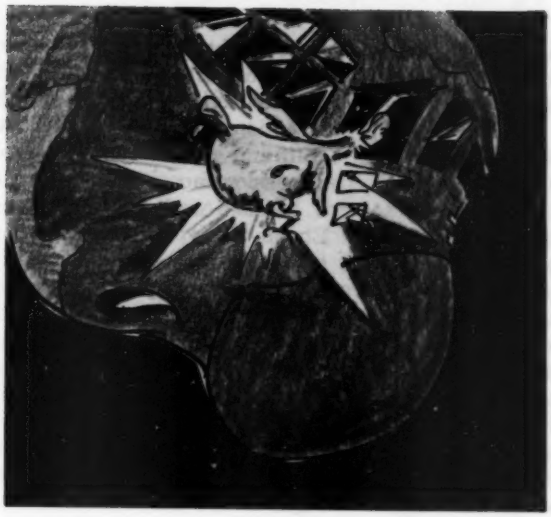
Dispensers of red carpet treatment take note!

WHICH SWITCH?

The H-1H, airborne for a little over an hour, weighed only 7,000 lbs. The crew briefed and began a practice manual fuel procedure at 500 ft over the center of the runway. To do so, the governor switch is placed in the *manual* position. The hazard in this mode of operation is "manual" doesn't provide rotor RPM overspeed protection; the hazard in "practicing" this maneuver is that the governor switch is located beside the *main* fuel switch; not very "Murphy" proof!

The upgrade copilot lowered the collective and rolled the throttle to flight idle. The IP in the right seat (here it comes!) had been guarding the switches, but removed his left hand from the center console switch area and checked the throttle at flight idle. Murphy struck, and when the IP placed his hand back, he put it on the wrong switch—he grabbed the main fuel switch, which he then turned off. The left seater tried to arrest descent rate by increasing throttle and collective. Soon after, the engine lost power and rotor RPM started decreasing. The instructor pilot took control and successfully autorotated the helicopter to the runway. After turning off the switches, he noticed the main fuel switch was already off and the fuel control switch still in automatic! Oops!





FEATHERLY ATTACK!

The C-130 was 15 minutes into a low-level tactical training mission when a birdstrike occurred at 500 ft AGL. The crew barely saw the large bird before it hit. The copilot flying the aircraft ducked left toward the throttle quadrant. The AC immediately took the controls. Small fragments of glass and bird came through the copilot's upper windshield lower right portion (surprisingly, the windshield remained in place, with only an 8-inch hole where most of the bird came through). The copilot, fortunately, was wearing sunglasses and received only minor cuts and bruises. The navigator suffered minor scratches and bruises as well. The "attacked" copilot was replaced by another, copilot that is, and the AC declared an emergency and landed uneventfully. Both copilot and navigator were treated and released.

Amazing how our "feather-light" friends turn into such "heavy hitters . . . ."

LIFE RAFT WITH A "LIFE" OF ITS OWN!

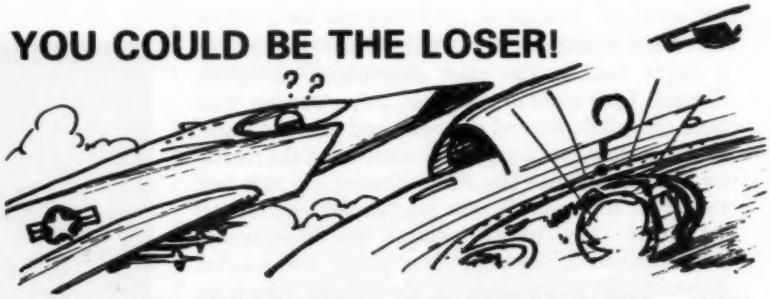
While cruising at FL 250, the C-130 crew noticed a slight buffet. The pilot disengaged autopilot. Seconds later more of the same, only stronger. This time the pilot reduced airspeed and lowered flaps. Investigating, the loadmaster discovered the reason for the vibrations—the left outboard life raft had deployed and was caught on the left horizontal stabilizer. The pilot declared an emergency, accomplished a controllability check and landed uneventfully. Unfortunately, the life raft tore from the horizontal stabilizer destroying any evidence of what may have caused the mishap.

Several life rafts have deployed, unassisted, in the last three months. Two possible reasons are: confusing installation instructions in tech orders or the possibility that a hard bounce, such as landing, may close the life raft vent. When this vent closes, the life raft can't breathe, so, when brought to altitude, the life raft expands, possibly enough to pop open the panel and eject it into the airflow. Unexpected inflation hurts all.

HOT HAND MIC

Those familiar with the C-141 cockpit know about the vast array of uses for the map storage compartment "cubby holes" located outboard of each pilot's seat. Those convenient "pit" receptacles have been used to organize everything from FLIP documents to box lunches (thus facilitating access to "eat one's way across the Atlantic"). Many have experienced the momentary anguish of "losing" something in that seemingly bottomless abyss, including the hand-held microphones which are usually suspended by one of the nearby hooks. Occasionally, the trigger switch of a microphone in the "pit" will be activated by some other object sharing the space, resulting in a "hot mic" situation on the flight deck. A hazard report from the field recently brought this recurring dilemma to the attention of the HQ MAC safety staff and generated considerable discussion about the possibility of a blocked radio transmission. Equally likely, however, is a stuck mic situation caused by a partially spread quick-don oxygen mask, or even a malfunctioning mic switch on one of the pilot's control yokes. Recommended action suggests greater attention by aircrew to fastening the microphone on an appropriate hook. In the event of a "hot mic" on the flight deck, recheck the hand-held mic as an initial aircrew action—that way, you won't miss that important call from "mother!"

MSL VERSUS AGL: YOU COULD BE THE LOSER!



Recently, one fearless fast mover almost rammed another fearless fast mover during low-level operational training. No, the two weren't participating in air-to-air combat maneuvers; they were each doing their own thing, in their own assigned altitude block. In other words, technically speaking, they had legal altitude separation, yet occupied the same airspace!

What happened was a classic "gotcha!" One aircraft was cleared in the low altitude block, determined by AGL reference; and the other was in a medium altitude block, determined by MSL reference. Unfortunately, assigning surface to 500 ft AGL in mountainous terrain can sometimes result in slight incursions into what some may consider the higher altitude structures. And in this case, that's exactly what happened.

While we were saved from tragedy this time due to some quick thinking and action on the part of one pilot, this incident must serve as a thought provoker for *all* of us. During flight planning and in-flight, be constantly aware of the myriad sheets of music other sky travelers are singing from. Key in on terms such as MSL and AGL, straight-in and circling, true and indicated, ad infinitum.

Spot the gotchas before they getcha!

After Deadlines

WANTED. Rated Captain or Major for assignment to HQ MAC staff as an editor for *The MAC Flyer.* Looking for creativity and desire to further flight safety goals by "spreading the word" through the favorite magazine of airlifters worldwide. For more information on this unique assignment, call Maj. Tom Weinzierl, Supervising Editor, AV 576-3534 or (618) 256-5542, commercial.

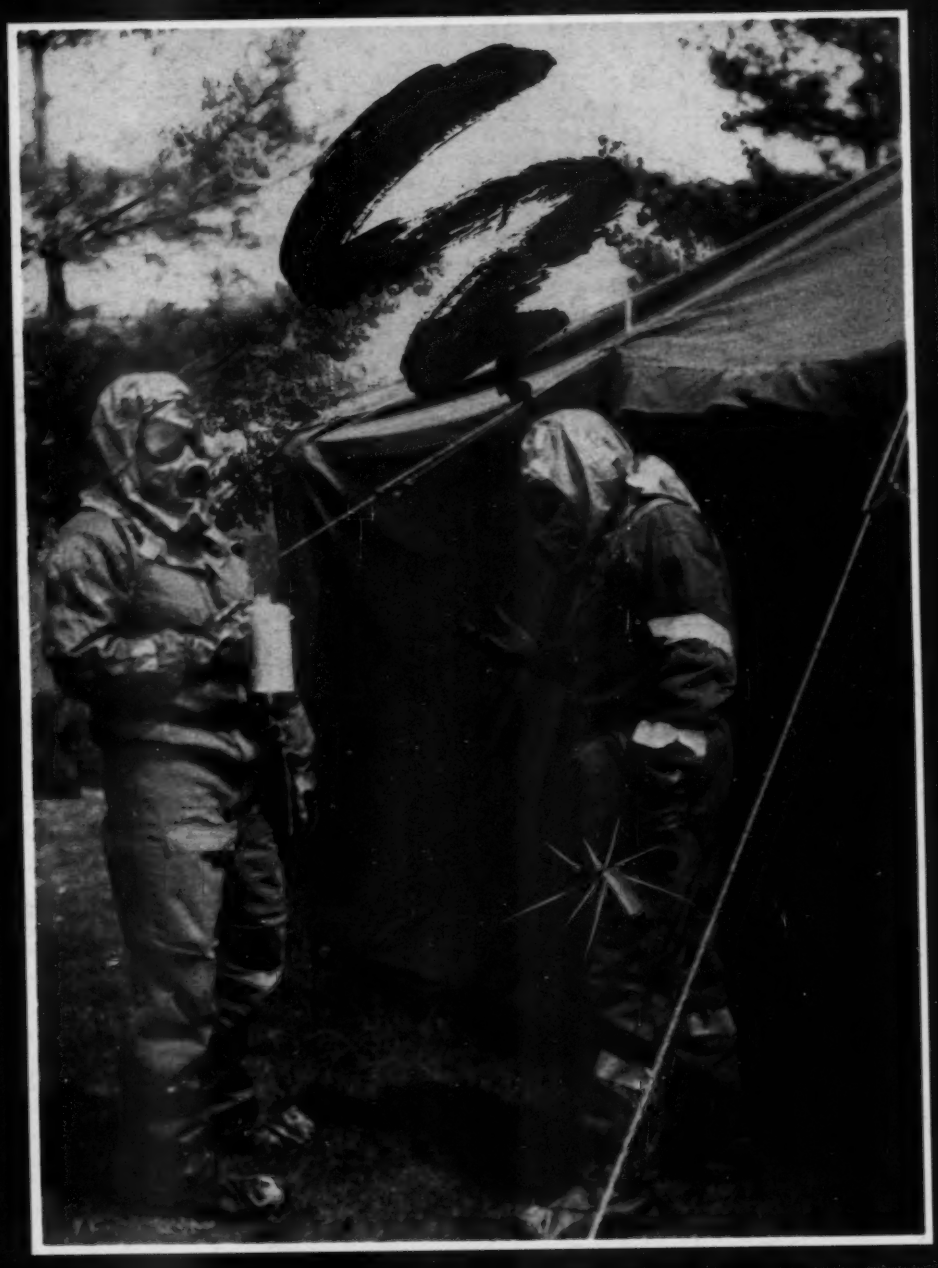
OSPREY ROLLOUT. A rollout ceremony in Texas recently marked the unveiling of the very first copy of the V-22 Osprey, scheduled for first flight late this summer. As the world's first production tilt-rotor aircraft, it can take off vertically and hover like a helicopter, then tilt its wingtip-mounted prop rotors forward to fly like a turboprop airplane--farther than 2,000 miles, faster than 300 mph, and at altitudes in excess of 25,000 feet. The Air Force version, the CV-22, is intended for long-range insertion and extraction of special operations forces. Plans call for delivery of a total of 55 CV-22s, and MAC currently projects interim operational capability by 1995.

YET ANOTHER WINNER. For the third year in a row, the prestigious Chief of Staff Individual Safety Award has been won by a member of the MAC safety community. The 1987 winner is Maj. Robert M. Bolton, Director of Safety, 322 Airlift Division. He earned the award "for his outstanding accomplishments in support of the accident prevention programs of the Military Airlift Command and the United States Air Force." Good show, Bob!

C-130 TRAGEDY. On 8 June, an Air National Guard C-130E assigned to 189 TAG crashed near Greenville Municipal Airport, Mississippi. All six crewmembers aboard were fatally injured. We share the grief with all those affected by this tragic loss and extend our deepest sympathy, especially to the families of the crew. *--TMF.*

U.S. GPO: 1988-554-015/80009

TOUCH N GO



Whatcha mean, "We're outa coffee?"